Thanet District Council

Detailed Assessment of the Existing AQMA

November 2022

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Document Control Sheet

Identification	
Client	Thanet District Council
Document Title	Detailed Assessment of the AQMA
Bureau Veritas Ref No.	AIR15710164

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Configuration				
Version	**Date**	**Author**	**Reason for Issue/Summary of Changes**	**Status**
1.0	10/11/2022	H Pearson	First Issue	

	Name	Job Title	Signature
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Executive Summary

Bureau Veritas have been commissioned by Thanet District Council to complete a review of the Council's existing Air Quality Management Area (AQMA). The Council currently has one AQMA which is declared for exceedences of the NO_2 annual mean Air Quality Strategy objective with the source identified as road transport.

A dispersion modelling assessment has been completed whereby NO_2 concentrations have been predicted across two areas of concern within the district at both specific receptor locations, and across a number of gridded areas to allow the production of concentration isopleths. This has been used to supplement local monitoring data to provide a clear picture of the pollutant conditions within the borough.

Following the completion of the analysis of both monitoring data and modelled concentrations across all of the assessed areas a number of recommendations have been made in terms of the AQMA study areas within the Thanet Urban AQMA:

- The Square, Birchington – Following completion of the detailed dispersion modelling based on 2019 data, there are no predicted exceedences of the annual mean NO_2 objective at any receptor locations within this area of the AQMA.

- St Lawrence, High Street - As a consequence of the modelling results, additional monitoring is recommended to be carried out in the area of the roundabout connecting the A255 and B2014, and the junction of the A255 with Margate Road. Monitoring locations along the B2014 are required to confirm if the trends seen in the modelling results reflect the area due to exceedences of the annual average NO_2 objective in the modelled data.

The next steps upon completion of this assessment are to develop, through consideration of merit, a defined set of achievable measures to be drawn forward into the revised action plan document.

1 Introduction

Bureau Veritas have been commissioned by Thanet District Council (the Council) to complete a detailed assessment of areas of the existing Thanet Urban Air Quality Management Area (AQMA).

The Council currently has one AQMA, the Thanet Urban AQMA which spans along the eastern coastal area and majority of urban areas throughout the borough of Thanet District Council. The AQMA is mainly characterised by urban and suburban areas. The AQMA area in Thanet is shown in Figure 1.1. This AQMA is declared for exceedences of the NO_2 annual mean Air Quality Strategy (AQS) objective with NO_2 source emissions identified as road transport.

Two areas within the AQMA were identified as ‘hot spots’ for assessment, these are further referred to in this report as The Square, Birchington and St Lawrence High Street. These areas historically have been reported by the Council as areas of concern due to exceedences of the NO_2 annual mean AQS objective. Other areas in the AQMA have not been considered due to monitored annual mean NO_2 concentrations well below the AQS objective.

Details of the areas included within this assessment of the Thanet Urban AQMA are as follows, and maps detailing the locations of these areas are presented in Figure 1.2 and Figure 1.3:

- The Square, Birchington – an area to the northwest of the Thanet Urban AQMA; and,
- St Lawrence High Street – an area to the southeast of the Thanet Urban AQMA where elevated NO_2 concentrations were noted in previous years.

1.1 Scope of Report

The assessment seeks, with reasonable certainty, to predict the magnitude and geographical extent of any exceedences of the Air Quality Strategy (AQS) objectives, providing the Council with updated modelling data that can be used to help inform decision making with regard to the AQMA.

The areas considered as part of this study are illustrated in the figures shown under each assessment area heading within this report. The following are the main objectives of this report:

- To assess the air quality at selected locations (receptors) at the façades of locations of relevant exposure, representative of worst-case exposure within the existing AQMA boundaries, based on modelling of emissions from road traffic on the local road network;
- To determine the geographical extent of any potential exceedence of the annual mean AQS objective for NO_2; and,
- To put forward recommendations as to the extent of any changes to the current AQMA boundary and any changes to the declaration of the specific AQMAs.

The approach adopted in this assessment to assess the impact of road traffic emissions on air quality utilised the atmospheric dispersion model ADMS-Roads, focusing on emissions of oxides of nitrogen (NO_x), which comprise of nitric oxide (NO) and NO_2.

The guiding principles for air quality assessments as set out in the latest guidance and tools provided by Defra for air quality assessment (LAQM.TG(22)[1]) have been utilised.

[1] Local Air Quality Management Technical Guidance LAQM.TG(22), August 2022, published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland

Figure 1.1 – Map of The Thanet Urban AQMA

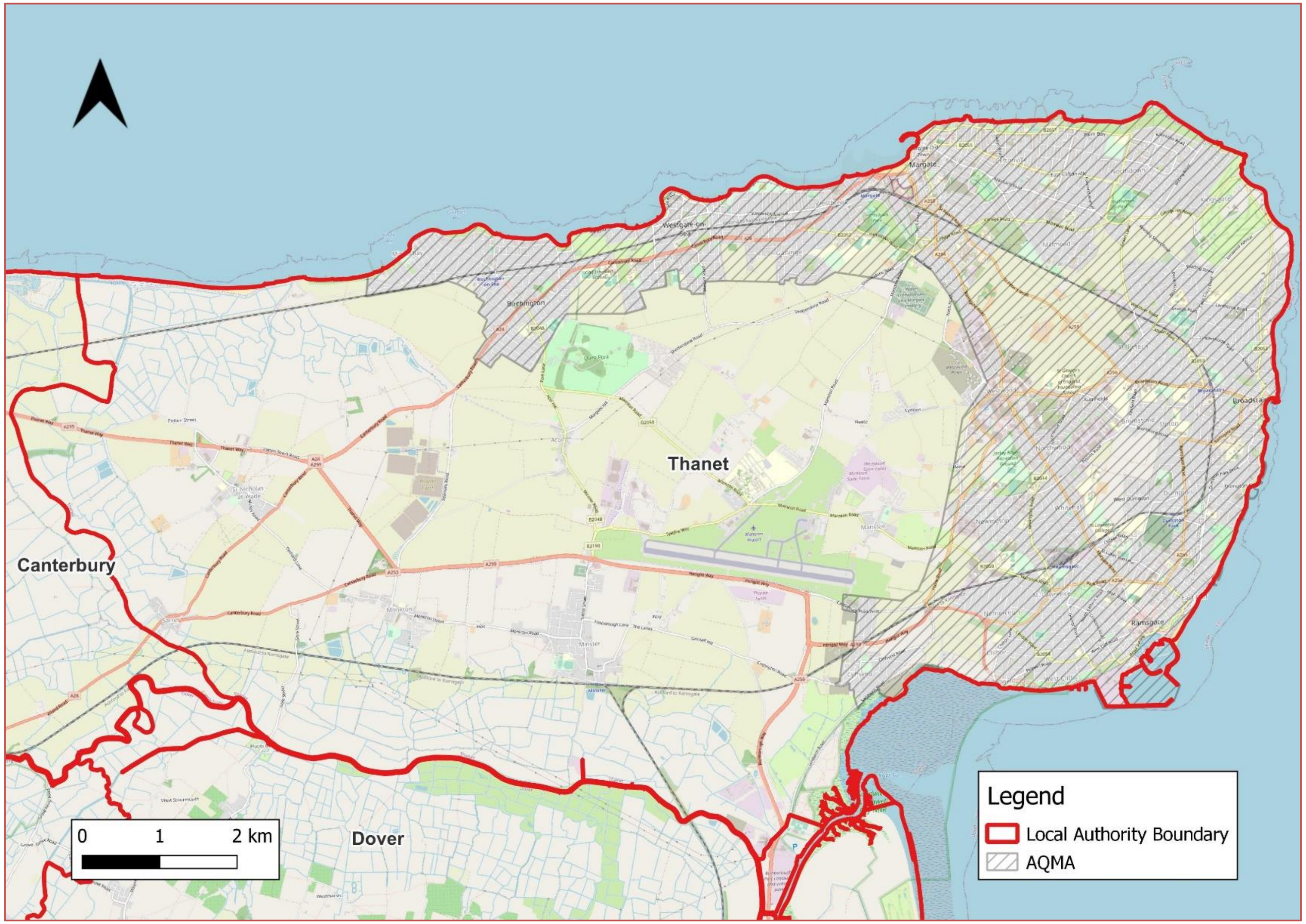


Figure 1.2 – Map of The Square, Birchington Study Area

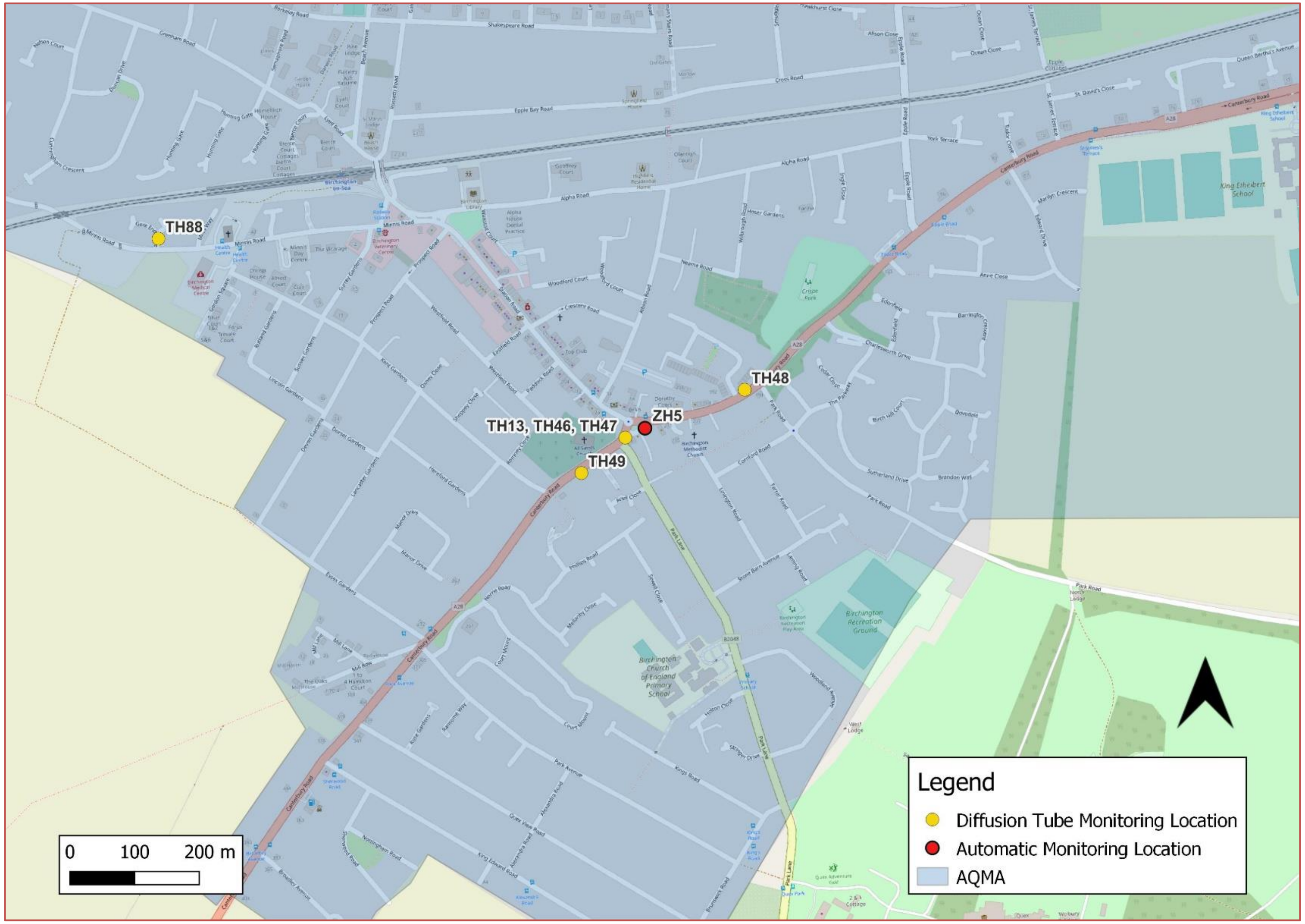


Figure 1.3 – Map of St Lawrence High Street Study Area

2 Assessment Methodology

Atmospheric modelling to predict the pollutant concentrations emitted from road traffic sources was carried out using ADMS Roads version 5.0.0.1, developed by Cambridge Environmental Research Consultants (CERC). The approach used was based upon the following:

- Prediction of NO_2 concentrations to which existing receptors may be exposed to, and a comparison with the relevant AQS objectives; and,

- Determination of the geographical extent of any potential exceedences with regard to the existing AQMA boundaries and proposed boundary changes stated in the previous assessment.

Pollutant concentrations have been predicted within a base year of 2019, with model inputs relevant to the assessment based upon the same year.

2.1 Traffic Inputs

Traffic flows for the road links included within the model have been sourced from the appointed transport consultant (Intelligent Data Collection) and from the DfT traffic count online resource[2].

Data from the traffic consultant was provided in 12hr turning counts for six road links. To convert these traffic counts to 24hr Annual Average Daily Traffic (AADT), a factor was determined based on the same methodology in which DfT count data had been converted in each area from 12hr flows to 24hr flows.

In the area of 'The Square', the 2017 DfT 2-way manual count for A28 Canterbury Road provided a 12hr total of 14,515 vehicles. This count point reported a 24hr flow of 16,504 vehicles for 2017. Based on this data, a factor of 1.1370 was applied to the provided traffic counts in this area to estimate 24hr AADT.

In the area of 'St Lawrence, High Street', the 2015 DfT 2-way manual count for A255 High Street provided a 12hr total of 10,557 vehicles. This count point reported a 24hr flow of 11,462 vehicles for 2015. Based on this data, a factor of 1.0857 was applied to the provided traffic counts in this area to estimate 24hr AADT.

The additional data which was sourced from the DfT counts provides an AADT flow for the relevant road link in terms of a number of vehicle types; cars, LGVs (light goods vehicles), HGVs (heavy goods vehicles), buses and coaches, and motorcycles. It is important to note that some of the traffic data used from the DfT is based on estimates either from nearby links or estimated from the most recent manual counts. Traffic data, which has been estimated from manual counts that were carried out over 3 years ago, have been highlighted in Appendix A.

The traffic data utilised within the dispersion modelling are presented in Appendix A.

Traffic speeds were modelled at the relevant speed limit for each road. However, in accordance with LAQM.TG(22), where appropriate, traffic speeds have been reduced to simulate queues at junctions, traffic lights and other locations where queues or slower traffic are known to occur.

The Emissions Factors Toolkit (EFT) version 11.0[3] has been used to determine vehicle emission factors for input into the ADMS-Roads model. The emission factors are based upon the traffic data inputs used within the assessment, with total vehicle flows and proportion of vehicle types taken from the provided traffic counts and existing DfT data. The pre-set national values for vehicle fleet in terms of vehicle Euro Class has been utilised in the absence of a vehicle fleet specific information for the area.

2.2 General Model Inputs

A site surface roughness value of 0.5m was entered into the ADMS-roads model, consistent with the suburban nature of the modelled domain. In accordance with CERC's ADMS Roads user guide[4], a minimum Monin-

[2] Department for Transport, traffic count data for available road links (2022), available at https://www.gov.uk/government/collections/road-traffic-statistics

[3] Defra, Emissions Factors Toolkit (2021), available at http://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html

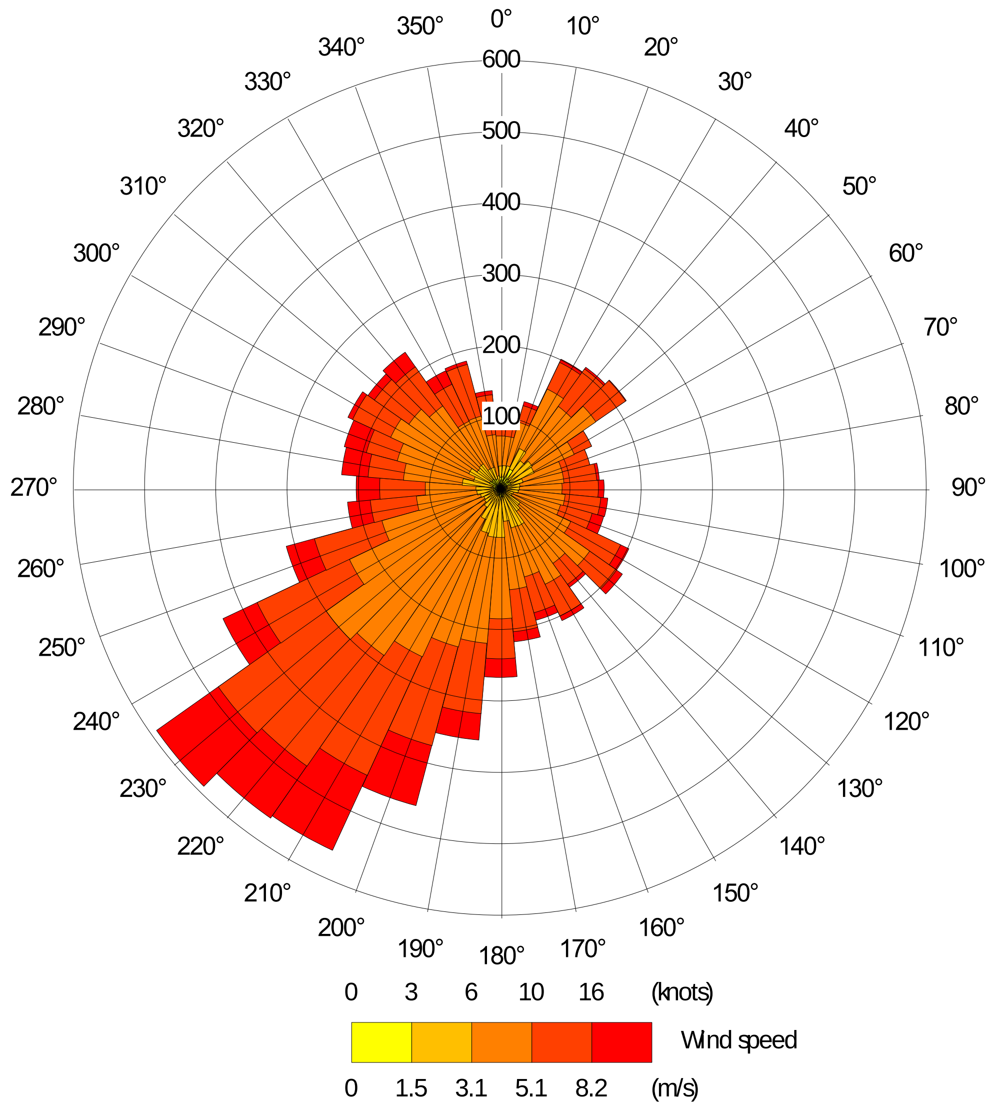
[4] CERC, ADMS-Roads User Guide Version 5 (2022)

Obukhov Length of 30m has been used for the ADMS Roads model to reflect the urban topography of the model domain.

One year of hourly sequential meteorological data from a representative synoptic station is required by the dispersion model. For the completion of the modelling, 2019 meteorological data from the Manston meteorological station has been used within this assessment. This particular site has been chosen due to it being the nearest site with a complete data set for 2019, and is representative of a parkland/suburban area and is at a similar elevation to the Thanet District Council area.

A wind rose for this site for the year 2019 is presented in Figure 2.1.

Figure 2.1 – Wind Rose for Manston 2019 Meteorological Data



2.3 Emission Sources

In 'The Square' area, a total of eight road sources were included throughout the model domain. In the 'St Lawrence, Birchington' area, a total of 14 road sources were included throughout the model domain.

Point sources have been accounted for within the model through the use of background maps. Road traffic is considered to be the primary source of the NO_2 emissions. The road links drawn are presented in Figure 2.2.

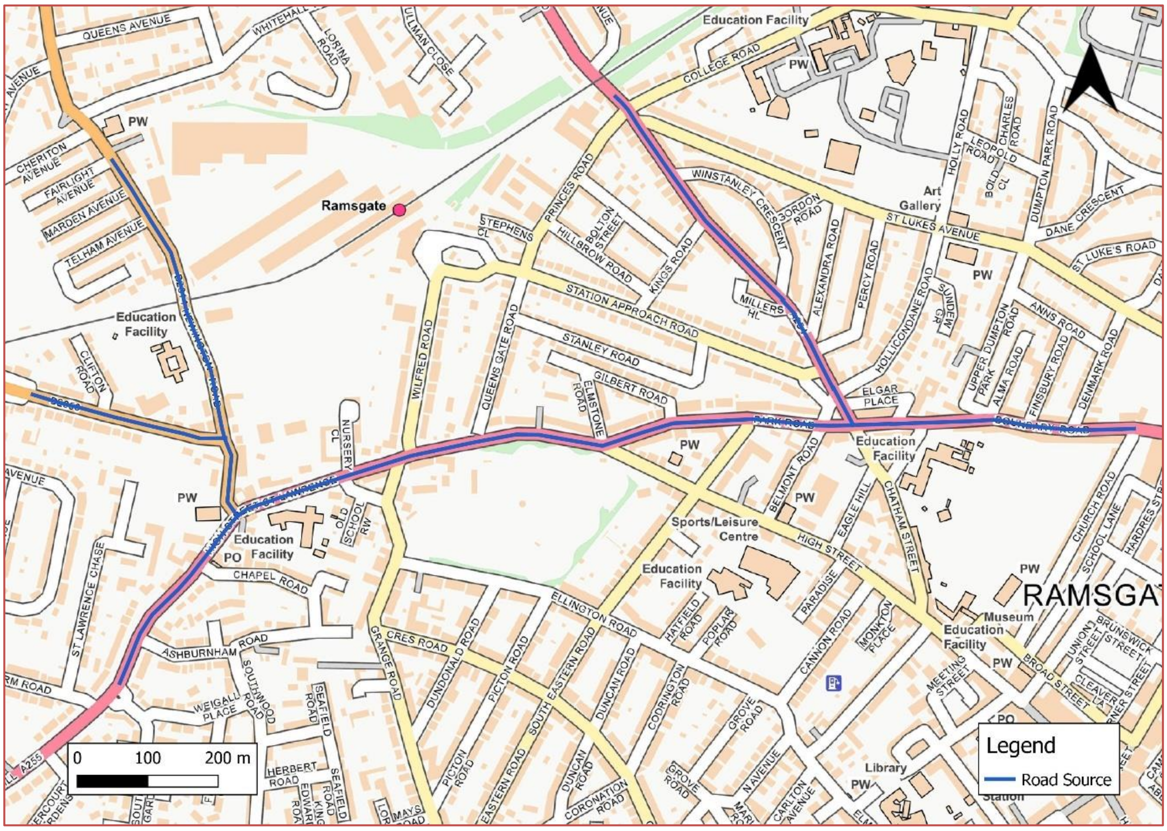
A 5m street canyons was also included along a short stretch of B2050 Park Lane in the 'The Square' study area where the roads were surrounded by buildings/walls on both sides. No variation in the gradient of the road sources was included, and remained at the default 0%, assuming the area is flat.

Whilst it is acknowledged that both study areas are located nearby to Manston Airport, it is not the dominant emissions source in the area. Review of the supporting ES chapter for the redevelopment of Manston Airport suggests that even during peak airport activity, impacts on NO_x emissions are insignificant. emissions from aviation from across the UK are included within the Background concentrations used in the modelling.

The roads were drawn along the primary and main roads throughout Thanet District Council. These were restricted due to where traffic data was available.

Figure 2.2 – Modelled Road Sources, The Square, Birchington

Figure 2.3 – Modelled Road Sources, St Lawrence High Street



2.4 Sensitive Receptors

Within 'The Square', eight discrete receptors were modelled, and within the 'St Lawrence, High Street' area 23 discrete receptors were modelled to represent locations of relevant exposure. The locations were identified through the completion of a desktop study. In addition, concentrations were also modelled across regular gridded areas set across the AQMAs, with a spatial resolution between the receptors of 10m x 10m. A receptor height of 1.5m was used for all gridded receptors modelled. The gridded receptor model was split into two areas to represent the 'The Square' study area and the 'St Lawrence, High Street' area. These were supplemented with additional receptor points added close to the modelled road links, using the intelligent gridding tool in ADMS-Roads.

The majority of the discrete receptors (31) were included at a height of 1.5m to represent ground level exposure, whereas one receptor within the 'The Square' area was included at an increased height of 4m to represent exposure at buildings with residential usage on the first storey.

2.5 Model Outputs

Background pollutant values for 2019 derived from the Defra background maps database[5] have been used in conjunction with the concentrations predicted by the ADMS-Roads model to calculate predicted total annual mean concentrations of NO_x.

To avoid duplication of the road source contribution from any 'Primary A Roads' in the modelling and assessment process, these source sectors have been removed from the overall background concentrations reported. This has been completed using the Defra NO_x Sector Removal Tool[6] v8.0.

Thanet District Council carries out monitoring of NO_2 at a number of background monitoring sites using both an automatic monitor and diffusion tubes. For modelling purposes, the Defra Background maps have been

[5] Defra Background Maps (2022), http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html

[6] Defra NO_2 Adjustment for NO_x Sector Removal Tool (2020), available at https://laqm.defra.gov.uk/air-quality/air-quality-assessment/no2-adjustment-for-nox-sector-removal-tool/

used as opposed to the available background monitoring data due to there not being sufficient monitoring sites to have a representative cover of the modelling domain. The background concentrations used within this assessment are presented in Appendix C.

For the prediction of annual mean NO_2 concentrations for the modelled scenarios, the output of the ADMS-Roads model for road NO_x contributions has been converted to total NO_2 following the methodology in LAQM.TG(22), using the NO_x to NO_2 conversion tool developed on behalf of Defra. This assessment has utilised the current version of the NO_x to NO_2 conversion tool, version 8.1[7]. The road contribution is then added to the appropriate NO_2 background concentration value to obtain an overall total NO_2 concentration.

2.5.1 Verification

Verification of the model has been carried out using a number of local authority NO_2 passive monitoring locations, in accordance with the methodology detailed within LAQM.TG(22). A verification exercise was undertaken for each study area to most accurately represent the air quality conditions locally. Details of the diffusion tube locations within Thanet District Council are presented in Table B.1. The locations and heights of these tubes have been adjusted and validated where required via a desktop study based on Google StreetView.

An initial verification was carried out for each study area, with the results presented in Appendix B. A separate verification factor was utilised for each study area to reflect the unique air quality conditions in each location. The models were adjusted accordingly in each area to represent traffic queueing, road widths, canyons and junctions. Details of these verifications are provided in Appendix B. The final verification factors applied are:

- The Square Verification – 4.167
- St Lawrence, High Street Verification – 6.547

Full details of the model verification completed can be found in Appendix B.

[7] Defra NO_x to NO_2 Calculator (2020), available at https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc

3 Assessment Results

The following section provides a detailed assessment for each study area within the Thanet Urban AQMA, comparing both the monitoring completed within the study area over a five-year period with the modelled concentrations of annual mean NO_2. Details of each monitoring location and the monitoring results have been taken from the 2022 Annual Status Report[8] completed by the Council.

In line with the standardised LAQM reporting, the tabulated results present any exceedences of the annual mean AQS objective of 40µg/m^3 in bold, and any predicted concentrations in exceedence of 60µg/m^3 have been underlined. Additionally, annual mean concentrations that are within 10% of the objective have been presented in italics in order to ensure that any uncertainty in relation to the predicted modelling concentrations is taken into consideration for any recommendations made in terms of AQMA designation, amendment or revocation.

Contour results have also been produced for each designation within the AQMAs, with concentration isopleths presented at both 40µg/m^3 and 36µg/m^3 (within 10% of the 40µg/m^3 objective). These have been produced from a gridded results layer covering the model domain. In addition, ADMS-roads automatically places a high number of additional receptors close to each modelled road link to increase the spatial resolution of the receptors.

3.1 The Square, Birchington

3.1.1 Council Monitoring Data

The Square, Birchington is an area located to the northwest of the Thanet Urban AQMA. The junction around The Square has been identified as an area where the NO_2 annual average AQS objective was exceeded. The current western boundary of the AQMA is approximately 534m from The Square roundabout at its closest point. Currently there are four diffusion tube monitoring locations for annual mean NO_2 concentrations in this area. Monitoring location TH13/46/47 is a location with monitoring in triplicate. A continuous NO_2 monitor is also located to the southeast of The Square roundabout at location ZH5. The current diffusion tube monitoring results for the previous five years are detailed in Table 3.1.

With the exception of monitoring location TH13/46/47, it can be seen that there have consistently been no exceedences of the annual mean NO_2 objective over the last five years. Monitoring location TH13/46/47 however has reported an exceedence of the annual average NO_2 AQS objective in 2017. Over the last five years, the annual mean NO_2 concentration at TH13/46/47 has fallen by over 10µg/m^3 to most recently in 2021 monitor an annual average NO_2 concentration of 30.3µg/m^3.

[8] Thanet District Council (2022), 2022 Air Quality Annual Status Report

Table 3.1 – Current NO_2 Monitoring Within, or in Close Proximity to The Square, Birchington

Site	Site Type	OS Grid Ref X	OS Grid Ref Y	Distance to Relevant Exposure (m)	Height (m)	Annual Mean NO_2 Concentration (µg/m^3)				
						2017	2018	2019	2020	2021
ZH5*	R	630284	169052	16	2.0	32.4	31.0	29.3	24.3	24.7
TH13/46/47	K	630253	169037	2	2.5	**40.6**	*37.3*	35.9	31.7	30.3
TH48	K	630438	169111	1	2.0	27.9	29.9	25.5	23.4	21.5
TH49	R	630185	168982	3	2.5	22.0	20.8	19.5	16.6	15.5
TH88	K	329531	169345	10	2.5	-	-	-	-	12.3

In **bold**, exceedence of the annual mean NO_2 AQS objective of 40µg/m^3.
When **underlined**, NO_2 annual mean exceeds 60µg/m^3, indicating a potential exceedence of the NO_2 1-hour mean objective
R= Roadside
K= Kerbside
* Automatic Monitoring Station

3.1.2 Modelled Receptors, Annual Mean NO_2

Table 3.2 provides the modelled annual mean NO_2 concentrations predicted at existing residential receptor locations in 2019. All eight discrete receptor locations are positioned within the boundary of the modelled study area. . None of these locations have predicted exceedences of the annual mean NO_2 objective, and they all have a concentration predicted to be below 10% of the AQS objective.

Figure 3.1 presents the modelled receptor locations alongside their predicted annual mean NO_2 concentrations. From this, it can be seen that all receptors have a predicted concentration of less than 36µg/m^3. The maximum reported concentration out of these receptors is at receptor R4, with a predicted concentration of 34.5µg/m^3. The nearest diffusion tube monitoring location to this is TH13/46/47, which reported an annual mean NO_2 concentration in 2019 of 35.9µg/m^3. The model is under predicting concentrations at this location by 0.74%. When taking into account the level of uncertainty in the area, it is possible to confirm that there are no modelled results which exceed 36 µg/m^3.

From the annual mean NO_2 concentration contour plots presented in

Figure 3.2, it can be seen that the extent of NO_2 emissions follow the modelled road sources with no receptors representative of relative exposure located in areas where the NO_2 AQS objective is exceeded.

Table 3.2 – The Square, Birchington, Summary of Modelled Receptor Results (NO_2)

Receptor ID	OS Grid X	OS Grid Y	Height (m)	In AQMA?	AQS objective (µg/m^3)	2019 Annual Mean NO_2 (µg/m^3)	% of AQS objective
R1	629663	168330	1.5	Y	40	18.4	46.1
R2	630077	168884	1.5	Y	40	30.5	76.2
R3	630186	168980	1.5	Y	40	27.4	68.5
R4	630257	169036	1.5	Y	40	34.5	86.2
R5	630262	169012	1.5	Y	40	26.7	66.7
R6	630393	169090	1.5	Y	40	31.3	78.3
R7	630435	169116	1.5	Y	40	23.8	59.6
R8	630200	169117	4.0	Y	40	15.8	39.5

Figure 3.1 – The Square, Birchington, Modelled Receptor NO_2 Concentrations

Figure 3.2 – The Square, Birchington, Modelled NO_2 Concentration Isopleths

3.2 St Lawrence High Street

3.2.1 Monitoring Data

The St Lawrence High Street area has been identified as an area for detailed assessment as monitoring within the area has exceeded the annual average AQS within the past five years. Currently there are five diffusion tube monitoring locations, monitoring annual mean NO_2. Monitoring locations TH54/64/65 and TH70/71/2 both have co-located triplicate diffusion tubes instead of a singular tube at each location. The current diffusion tube monitoring results for the previous five years are detailed in Table 3.3.

Across the last three years (2019 – 2022), monitoring locations TH54/64/65, TH66, and TH86 have monitored annual average NO_2 concentrations well below the annual average NO_2 objective.

Diffusion tube location TH85 monitored an annual average NO_2 concentration of 41.8µg/m^3 in 2018 which was in exceedence of the annual average NO_2 AQS objective during 2018. The following year in 2019, this reduced to an annual average concentration of 29.2µg/m^3. There are no air quality specific measures outlined within Thanet District Council's annual status report or air quality action plan which are aimed specifically at this area to directly reduce NO_2 concentrations. Traffic emissions have been identified as the main NO_2 source in this area, however the traffic data in the area remains relatively similar between 2018 and 2019. It is unknown why there is such a significant decrease in NO_2 concentrations between 2018 and 2019, however it is noted that the decreasing trend continued during 2020 and 2021.

Triplicate diffusion tube location TH70/71/72 has reported annual average NO_2 concentrations within 10% of the AQS objective within the past 3 years. During 2019, an annual average NO_2 concentration of 37.6µg/m^3 was monitored, this reduced to 30.7µg/m^3 and 30.8µg/m^3 in 2020 and 2021 respectively. Although the monitoring results during 2020 and 2021 are below the AQS objective, these should be treated with caution due to the COVID-19 pandemic.

Table 3.3 – Current NO_2 Monitoring Within St Lawrence High Street

Site	Site Type	OS Grid Ref X	OS Grid Ref Y	Distance to Relevant Exposure (m)	Height (m)	Annual Mean NO_2 Concentration (µg/m^3)				
						2017	2018	2019	2020	2021
TH54/64/65	R	637134	165353	7	2.5	*38.0*	32.7	33.7	28.9	27.8
TH66	R	637111	165330	3	2.5	26.3	24.7	24.0	21.3	19.6
TH70/71/72	R	637091	165339	0	2.5	**41.6**	*38.6*	*37.6*	30.7	30.8
TH85	R	638026	165442	0	3.0	**-**	**41.8**	29.2	25.4	23.6
TH86	R	637747	165713	2	3.0	**-**	*36.7*	23.4	20.9	21.0

In **bold**, exceedence of the annual mean NO_2 AQS objective of 40µg/m^3.
When **underlined**, NO_2 annual mean exceeds 60µg/m^3, indicating a potential exceedence of the NO_2 1-hour mean objective
R= Roadside

3.2.2 Modelled Receptors, Annual Mean NO_2

Table 3.4 provides the modelled annual mean NO_2 concentrations predicted at existing sensitive receptor locations of relative exposure in 2019, as well as sensitive receptors of nearby schools (Ellington Infant School). 23 discrete receptor locations are positioned within the study area, all of which are within the Thanet Urban AQMA. Three receptors predicted an exceedence of the annual mean NO_2 objective with the maximum predicted NO_2 concentration located at R19. Two areas were identified where the annual average NO_2 concentrations were predicted to be exceeded in 2019: the A255/B2014 roundabout and the A255 junction with A254 Margate Road. All other receptor locations are predicted to be well below the objective limit value.

Within the area of the A255/B2014 roundabout, modelled receptors R3 and R4 exceeded the annual average NO_2 objective, whilst modelled receptors R5 and R6 were within 10% of the annual average NO_2 objective. Receptor R3 is close to diffusion tube monitoring location TH70/71/72, but closer to the roundabout and queueing traffic and therefore is likely to experience a higher annual average NO_2 concentrations due to its closer proximity to emission sources. Modelled receptors R4, R5 and R6 are all located along the B2014 which is north of existing monitoring locations. All monitoring locations within the area are only along the A255 High Street, therefore the predicted concentrations of NO_2 along the B2014 are not able to be verified if they reflect the real-time environment. Further diffusion tube monitoring within this area would assist in determining if the modelled worst-case scenario is representative.

The other area which predicted an exceedence of the annual average NO_2 AQS objective was at R19, located at the junction of the A255 with Margate Road. Receptors were included within the modelling to the north, east and west of this junction which predicted NO_2 concentrations below 90% of the annual average NO_2 AQS in 2019. This suggests that the affected area may be small, however due to the presence of residential receptors surrounding this junction further consideration is required. There is limited diffusion tube monitoring surrounding this junction, so it is recommended that further monitoring is undertaken surrounding this junction to ascertain the extent of any exceedences of the annual average NO_2 objective.

Figure 3.3 presents the modelled receptor locations alongside their predicted annual mean NO_2 concentrations.

From the annual mean NO_2 concentration contour plots presented in Figure 3.4, it can be seen that the extent of the predicted exceedences of the annual mean objective are constrained to the two identified areas surrounding the A255/B2014 roundabout and the A255 junction with Margate Road. The contour lines follow the geometry of the road and the gridded receptors have only been modelled at 1.5m heights from the modelled sources to best simulate human exposure.

Table 3.4 – St Lawrence High Street, Summary of Modelled Receptor Results (NO_2)

Receptor ID	OS Grid X	OS Grid Y	Height (m)	Inside AQMA?	AQS objective (µg/m³)	2019 Annual Mean NO_2 (µg/m³)	% of AQS objective
R1	637134.0	165362.0	1.5	Y	40	29.1	72.9
R2	637117.0	165323.0	1.5	Y	40	28.3	70.8
R3	637089.6	165337.3	1.5	Y	40	**47.9**	119.8
R4	637070.6	165376.9	1.5	Y	40	**40.4**	101.1
R5	637055.2	165401.0	1.5	Y	40	*38.2*	95.5
R6	637038.0	165440.0	1.5	Y	40	*37.4*	93.6
R7	637005.0	165528.0	1.5	Y	40	20.1	50.1
R8	636939.0	165435.0	1.5	Y	40	19.2	48.0
R9	636995.0	165443.0	1.5	Y	40	28.3	70.9
R10	637013.0	165258.0	1.5	Y	40	31.8	79.4
R11	637063.0	165279.0	1.5	Y	40	26.6	66.4
R12	637204.0	165356.0	1.5	Y	40	26.8	67.1
R13	637250.4	165376.7	1.5	Y	40	34.7	86.9
R14	637263.0	165406.0	1.5	Y	40	24.5	61.3
R15	637488.0	165449.0	1.5	Y	40	26.4	65.9
R16	637623.0	165443.0	1.5	Y	40	27.2	68.1
R17	637719.4	165442.8	1.5	Y	40	28.0	70.1
R18	637885.8	165441.8	1.5	Y	40	34.2	85.5
R19	637943.8	165461.7	1.5	Y	40	**56.8**	141.9
R20	638026.0	165443.0	1.5	Y	40	31.2	78.1
R21	637875.0	165567.0	1.5	Y	40	28.3	70.7
R22	637749.0	165715.0	1.5	Y	40	26.2	65.4
R23	637716.0	165782.0	1.5	Y	40	28.3	70.8

Figure 3.3 – St Lawrence, High Street, Modelled Receptor Locations

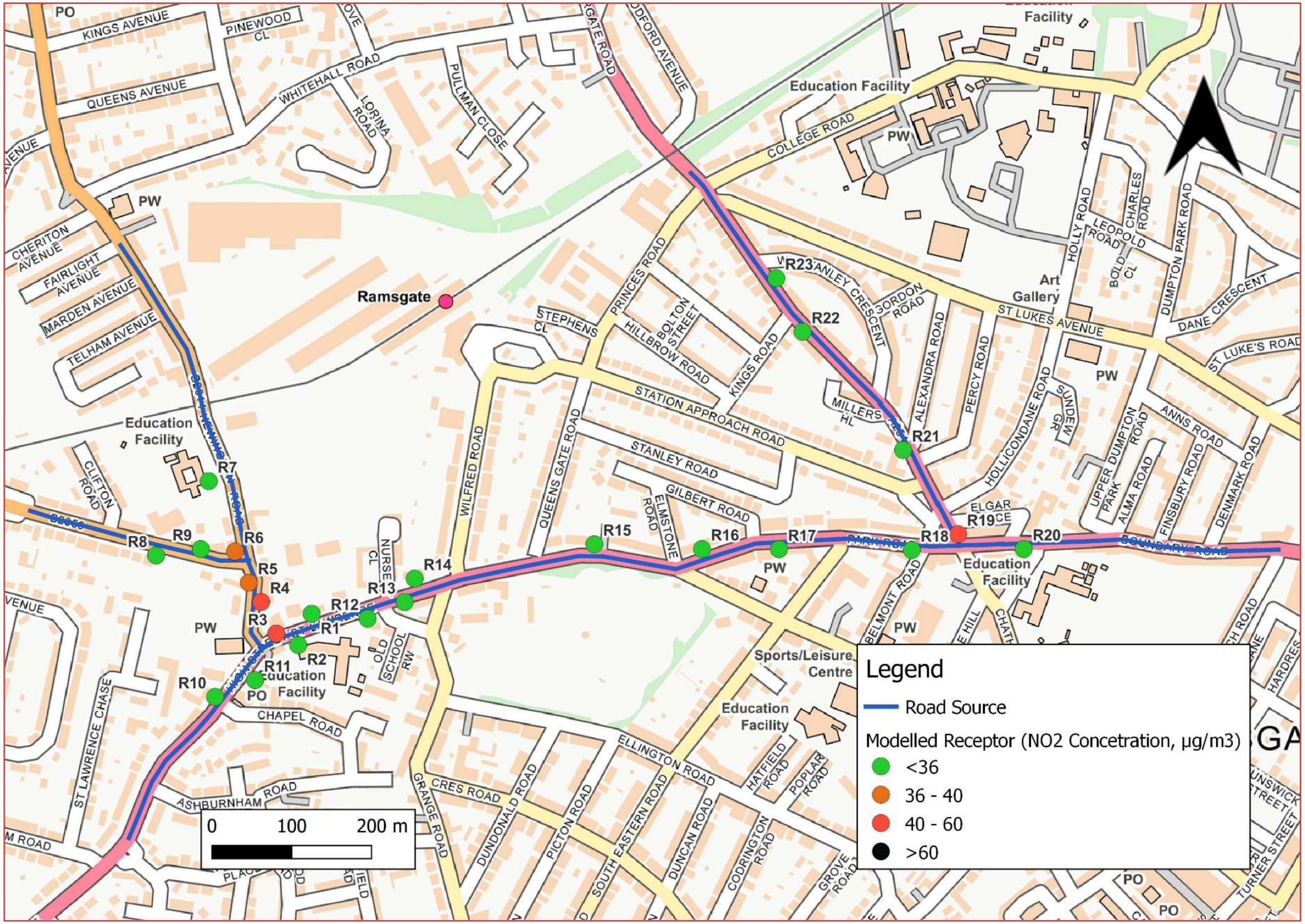
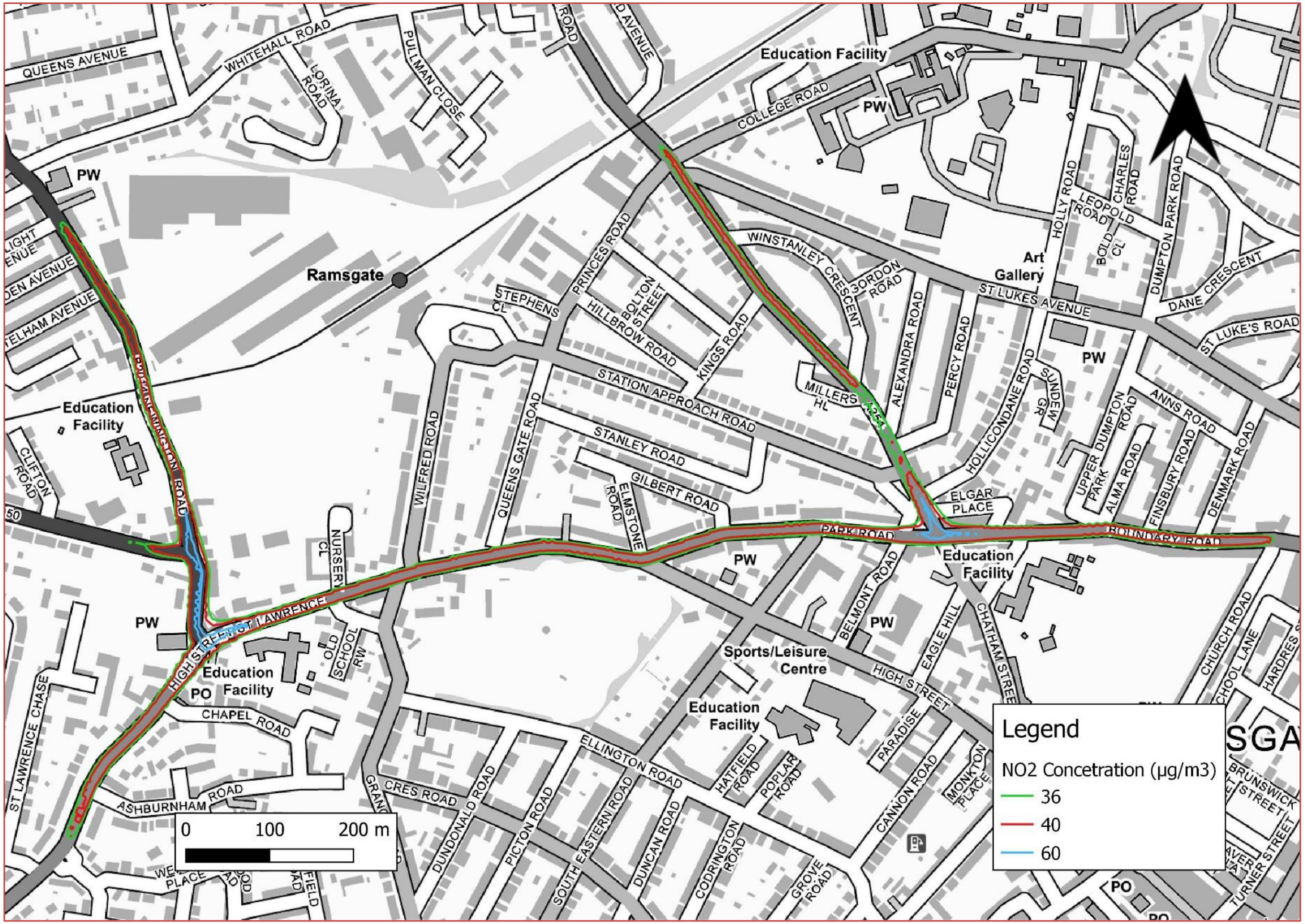


Figure 3.4 – St Lawrence, High Street, Modelled NO_2 Concentration Isopleths



4 Conclusions and Recommendations

Following the completion of the analysis of both monitoring data and modelled concentrations across the assessed areas, a number of recommendations have been made in terms of the current designation and boundary of the Thanet Urban AQMA.

4.1 The Square, Birchington

The 'The Square, Birchington' study area of the Thanet Urban AQMA is currently designated for exceedences of the annual mean NO_2 AQS objective. The area contains one automatic monitoring location and four diffusion tube monitoring locations within the study area. In the most recently available years of monitoring (2018 – 2021) there have been no exceedences within the area. In addition, all monitored annual average NO_2 concentrations have been below 90% of the AQS (36 µg/m^3) since 2019.

The detailed dispersion modelling of the study area indicated no exceedences of the AQS objective or any areas of relative exposure above 90% of the AQS objective. When accounting for model uncertainty, there were still no modelled receptors or locations of relative exposure in exceedence of 36µg/m^3.

4.2 St Lawrence High Street

The 'St Lawrence, High Street' study area of the Thanet Urban AQMA is currently designated for exceedences of the annual mean NO_2 AQS objective. The study area contains five diffusion tube monitoring locations with data available at all locations for at least the last 4 years (2018 – 2021).

This area of the Thanet Urban AQMA is currently designated for exceedences of the annual mean. Diffusion tube monitoring within the area has indicated area-wide compliance with the annual average NO2 AQS objective during the latest three years data is available (2019 – 2021). Triplicate diffusion tube location TH70/71/72 has reported annual average NO_2 concentrations within 10% of the AQS objective within the past 3 years. During 2019, an annual average NO_2 concentration of 37.6µg/m^3 was monitored, this reduced to 30.7µg/m^3 and 30.8µg/m^3 in 2020 and 2021 respectively. Although the monitoring results during 2020 and 2021 are below the AQS objective, these should be treated with caution due to the COVID-19 pandemic.

The modelling results show that at relevant points of exposure, most sites have a predicted concentration well below the AQS objective, however three receptors (R3, R4 and R19) predicted a concentration in exceedence of this, with an additional two receptors (R5 and R6) predicted concentrations within 10% of the AQS objective. Two areas of concern were identified where exceedences of the AQS objective were predicted, the roundabout connecting the A255 and B2014, and the junction of the A255 with Margate Road.

Appendices

Appendix A – Traffic Data

Table A.1 – Traffic Data Inputs – The Square, Birchington

Source ID	Description	2019 Traffic Flow (AADT)	% Car	% LGV	% HGV	% Bus/ Coach	% Motorcycle
L1*	A28 Canterbury Rd East	16765	78.58	17.37	1.93	1.34	0.79
L2*	A28 Canterbury Rd South	18896	79.46	16.97	1.83	0.85	0.88
L3*	The Square	8853	82.32	14.94	1.05	0.98	0.71
L4	B2050 Park Lane	5873	86.14	12.77	0.58	0.09	0.43
Notes: * = Factor of 1.1370 applied to estimate 24hr AADT							

Table A.2 – Traffic Data Inputs – St Lawrence High Street

Source ID	Description	2019 Traffic Flow (AADT)	% Car	% LGV	% HGV	% Bus/ Coach	% Motorcycle
L1*	B2014 Newington Road	15712	82.24	14.88	1.18	0.61	1.08
L2*	A255 High Street	16565	82.24	14.94	1.35	0.52	0.94
L3*	A255 High Street (SW)	15596	80.01	17.03	2.01	0.10	0.84
L4	B2050 Manston Rd	9544	85.41	12.38	0.75	0.36	1.09
L5	A254 Margate Rd	13996	86.27	10.67	0.48	1.49	1.09
Notes: * = Factor of 1.0857 applied to estimate 24hr AADT							

Appendix B – Verification

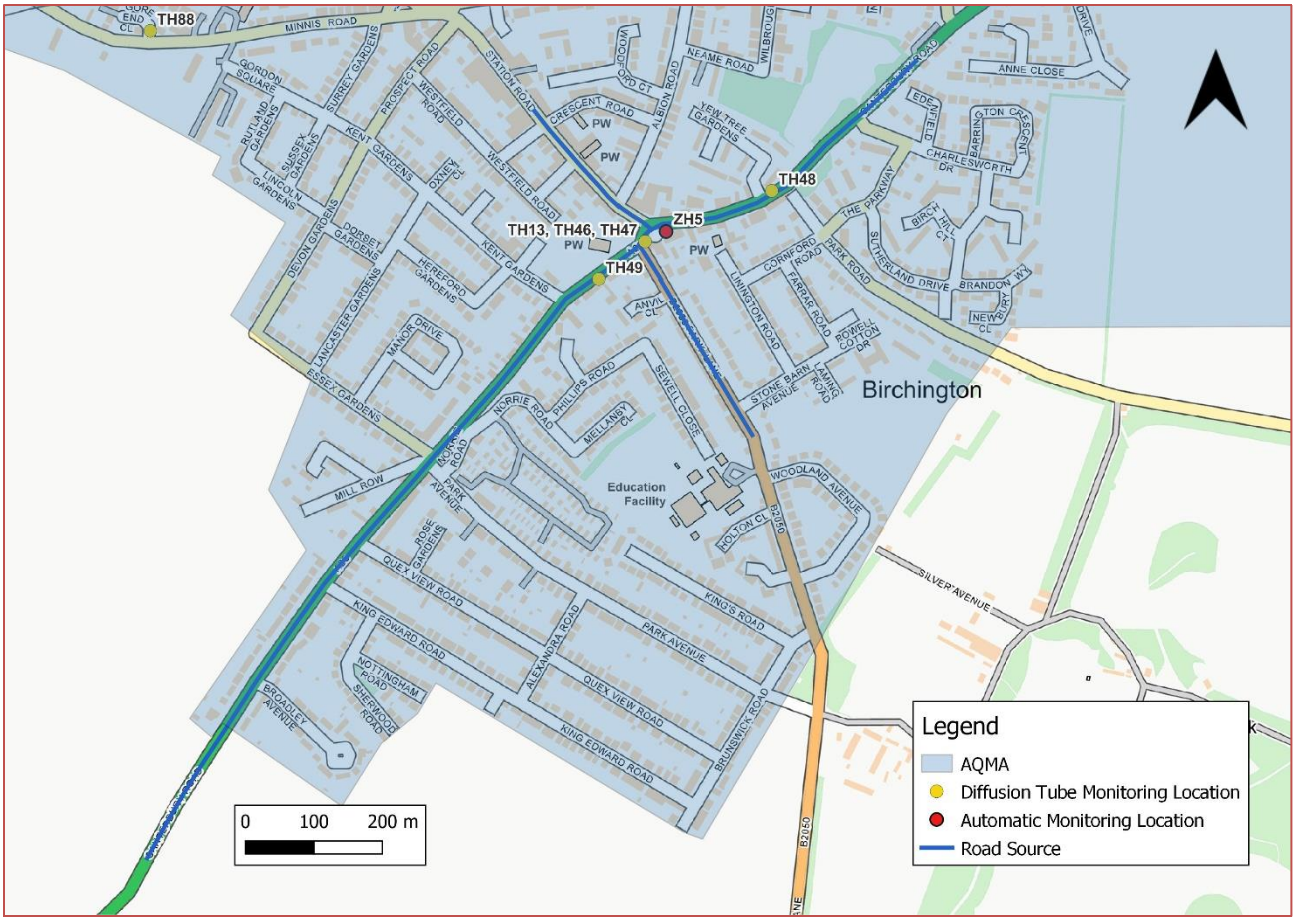
Table B.1 – Details of All Passive NO_2 Monitoring Locations within Thanet District Council

Site ID	X Coordinate	Y Coordinate	Site Type	Height (m)
TH05	639020	167982	Kerbside	2.5
TH10	635539	169840	Kerbside	2.5
TH13/46/47	630254	169037	Kerbside	2.5
TH16	630254	169037	Urban Background	2.5
TH26	630254	169037	Kerbside	2.5
TH27	634445	164416	Urban Background	2.5
TH31	638492	165410	Urban Background	2.5
TH32	639097	165971	Urban Background	2.5
TH33	634662	166026	Urban Background	2.5
TH34	632994	166428	Roadside	2.5
TH36	631161	165486	Kerbside	2.5
TH37	636570	167894	Suburban	2.5
TH48	636405	168227	Kerbside	2.0
TH49	635932	165333	Roadside	2.5
TH51/52/53	630438	169111	Roadside	2.5
TH54/64/65	630186	168983	Roadside	2.5
TH55	638472	165432	Roadside	2.0
TH59	638472	165432	Kerbside	2.5
TH66	638472	165432	Roadside	2.5
TH67/68/69	637135	165354	Kerbside	2.5
TH70/71/72	637135	165354	Roadside	2.5
TH76	637135	165354	Roadside	2.0
TH77	636815	167297	Kerbside	1.5
TH78	638220	168614	Roadside	2.0
TH79	637112	165331	Roadside	2.5
TH81	638536	165465	Roadside	2.5
TH82	638536	165465	Roadside	2.5
TH83	638536	165465	Roadside	2.5
TH84	637092	165340	Kerbside	3.0
TH85	637092	165340	Roadside	3.0
TH86	637092	165340	Roadside	3.0
TH88	634752	170679	Kerbside	2.5
TH89	630972	164708	Kerbside	2.5
TH90	636014	167851	Roadside	2.5
TH87	625641	165002	Roadside	2.5

The Square, Birchington Verification

The ‘The Square’ verification factor includes diffusion tubes TH13/46/47, TH48, TH49 and ZH5, as these were all located within the study area and likely to be more representative of the pollutant emissions here. These are presented, alongside the verification domain, in Figure B.1. The results of this initial study area verification is presented in Table B.2, and it can be seen that TH49 is overpredicting, whilst the other monitoring locations are under predicting. The over prediction at location TH49 was due to the diffusion tube location distance to the road being incorrect in the ASR. All tubes were modified to the correct distance from the road source for further verification.

Figure B.1 – The Square Verification Domain and Diffusion Tubes used for Verification



The results of the final ‘The Square’ verification factor is presented in Table B.3 and Figure B.3. Although TH13/46/47, TH48 and ZH5 are still under predicting and TH49 is over-predicting they are within the ±25% acceptance level. Alongside this, the RMSE for this verification is 2.1µg/m³, and the R^2 value is 1, indicating that this finalised verification is performing accurately. It is important to note that the R^2 value is influenced by the number of data points used to produce a line, and in this case, there are only 4. The verification factor used for any receptors located within the ‘The Square’ study area is 4.167.

Table B.2 – Initial The Square Model Outputs

Site ID	Background NO_2 (µg/m³)	Modelled total NO_2 (µg/m³)	Modelled total NO_2 (µg/m³)	% Difference (modelled NO_2 vs. monitored NO_2)
TH13/46/47	9.6	35.9	16.2	-54.8
TH48	9.6	29.9	14.6	-51.2
TH49	9.5	19.5	13.0	-33.5
ZH5	9.6	29.3	14.4	-51.0

Figure B.2 – Initial The Square Monitored NO_2 Concentrations vs. Modelled NO_2

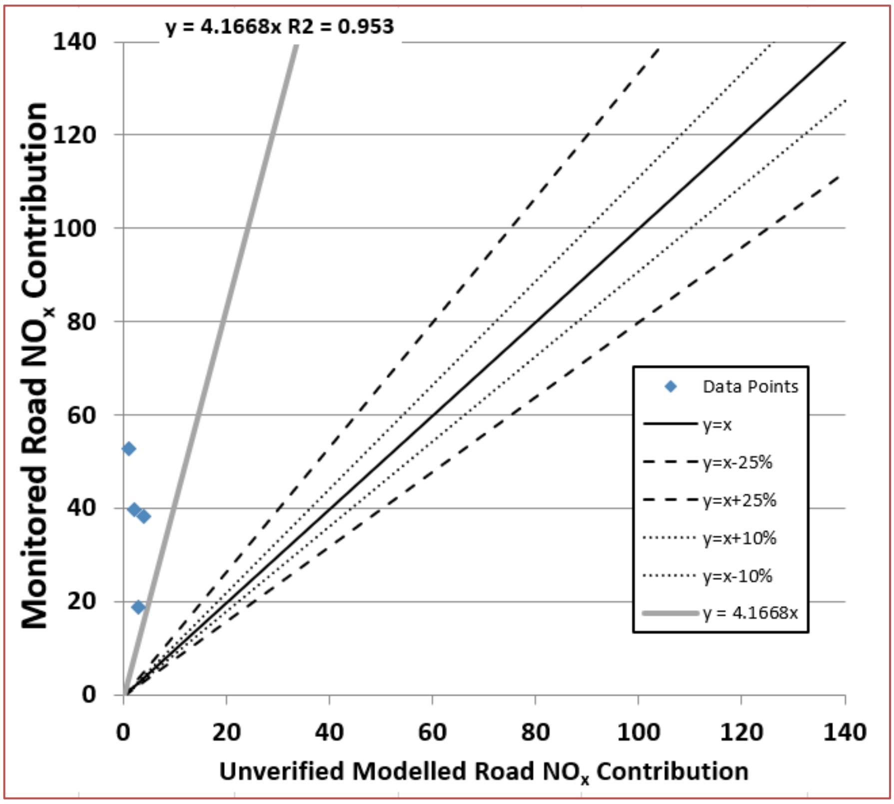
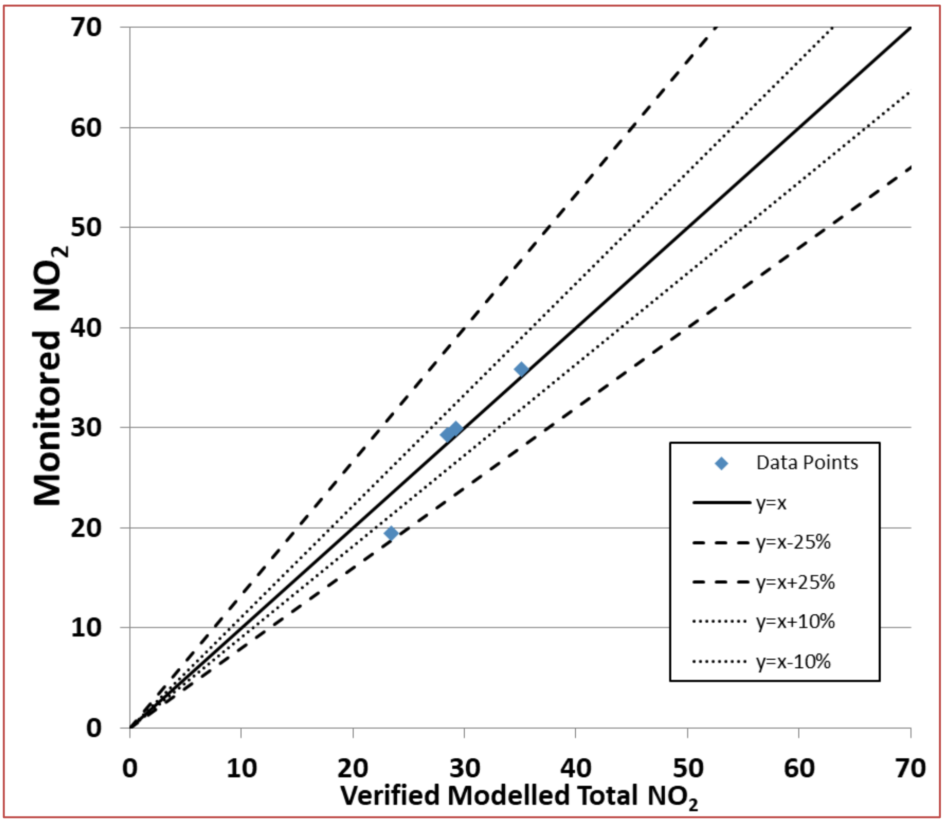


Table B.3 – Final The Square Verification

Site ID	Ratio of monitored road contribution NO_x / modelled road contribution NO_x	Adjustment factor for modelled road contribution NO_x	Adjusted modelled road contribution NO_x (µg/m³)	Adjusted modelled total NO_x (including background NO_x) (µg/m³)	Modelled total NO_2 (based upon empirical NO_x / NO_2 relationship) (µg/m³)	Monitored total NO_2 (µg/m³)	% Difference (adjusted modelled NO_2 vs. monitored NO_2)
TH13/46/47	4.30	4.167	51.25	63.82	35.16	35.90	-0.74
TH48	4.32		38.35	50.92	29.24	29.90	-0.66
TH49	2.94		26.54	38.96	23.44	19.50	3.94
ZH5	4.38		36.62	49.19	28.43	29.30	-0.87

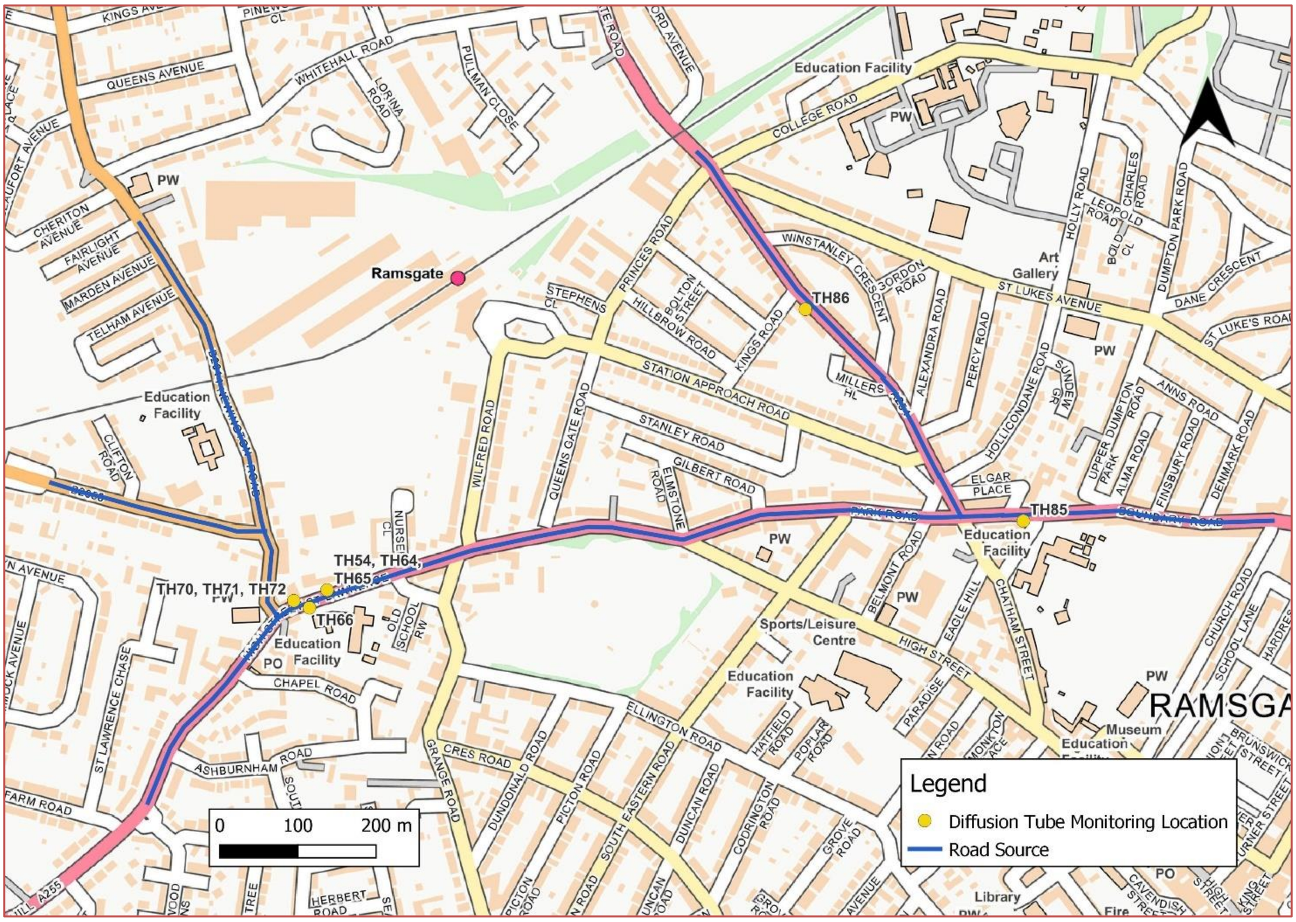
Figure B.3 – Final The Square Adjusted Verification Monitored NO_2 Concentrations vs. Verified Modelled NO_2



St Lawrence High Street Verification

Using the monitoring sites located within the St Lawrence High Street study area, an initial verification was carried out. Diffusion tubes TH54/64/65, TH66, TH70/71/72, TH85 and TH86 were utilised within the verification exercise. The verification domain and monitoring site locations can be seen in Figure B.4. The results of this are shown in Table B.4. Although all modelled diffusions tubes were within 10% of the monitored concentrations, adjustments to correct the distances of the monitoring locations to the modelled road sources was undertaken. Diffusion tube TH66 was located at a bus stop and parking bay outside a school and therefore was omitted from the verification process. Diffusion tube TH85 was under predicting and is located close to a junction susceptible to queueing traffic and a parking area on the road it is located on, therefore TH85 was also omitted from the verification process.

Figure B.4 – St Lawrence High Street Verification Domain and Diffusion Tubes used for Verification



The final verification for the St Lawrence High Street area is presented in Table B.5 and

Figure B.6. Although two monitoring locations are under predicting, and one is over predicting, no further adjustments could be carried out to the model in this area to improve on the 1% margins. This verification has an RMSE of 1.1µg/m³, and an R^2 value of 1. The verification factor is 6.574, and has been used for all receptors located in the St Lawrence High Street study area.

Table B.4 – Initial St Lawrence High Street Area Model Outputs

Site ID	Background NO_2 (µg/m³)	Modelled total NO_2 (µg/m³)	Modelled total NO_2 (µg/m³)	% Difference (modelled NO_2 vs. monitored NO_2)
TH54/64/65	11.3	33.7	14.8	-56.1
TH70/71/72	11.3	37.6	15.9	-57.7
TH86	11.3	23.4	13.0	-44.4

Figure B.5 – Initial St Lawrence High Street Monitored NO_2 Concentrations vs. Modelled NO_2

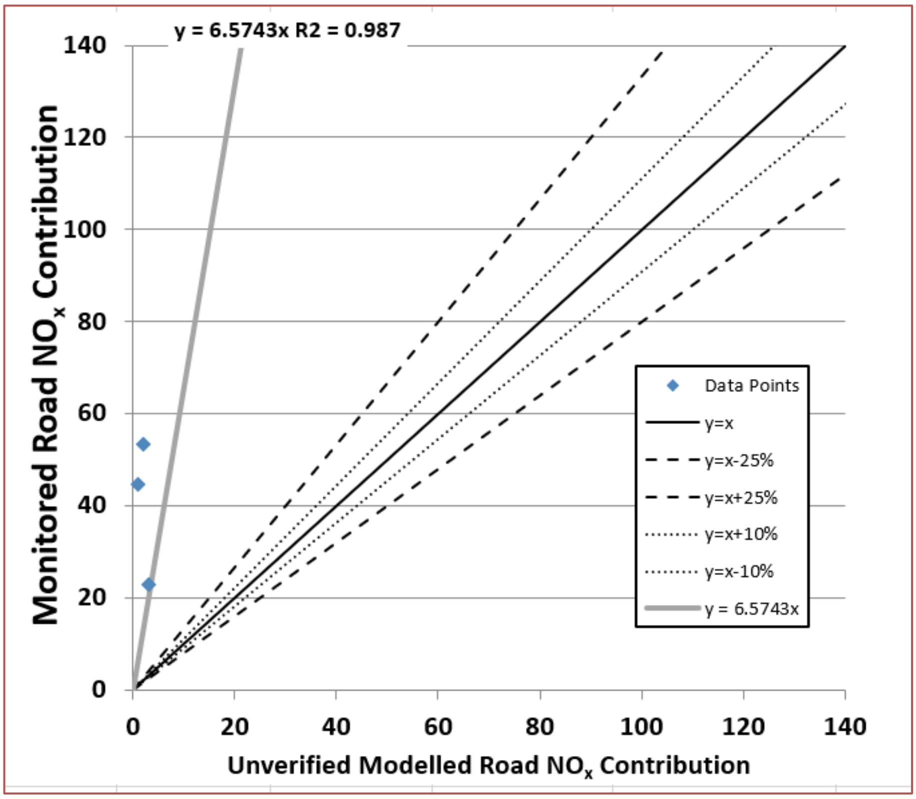
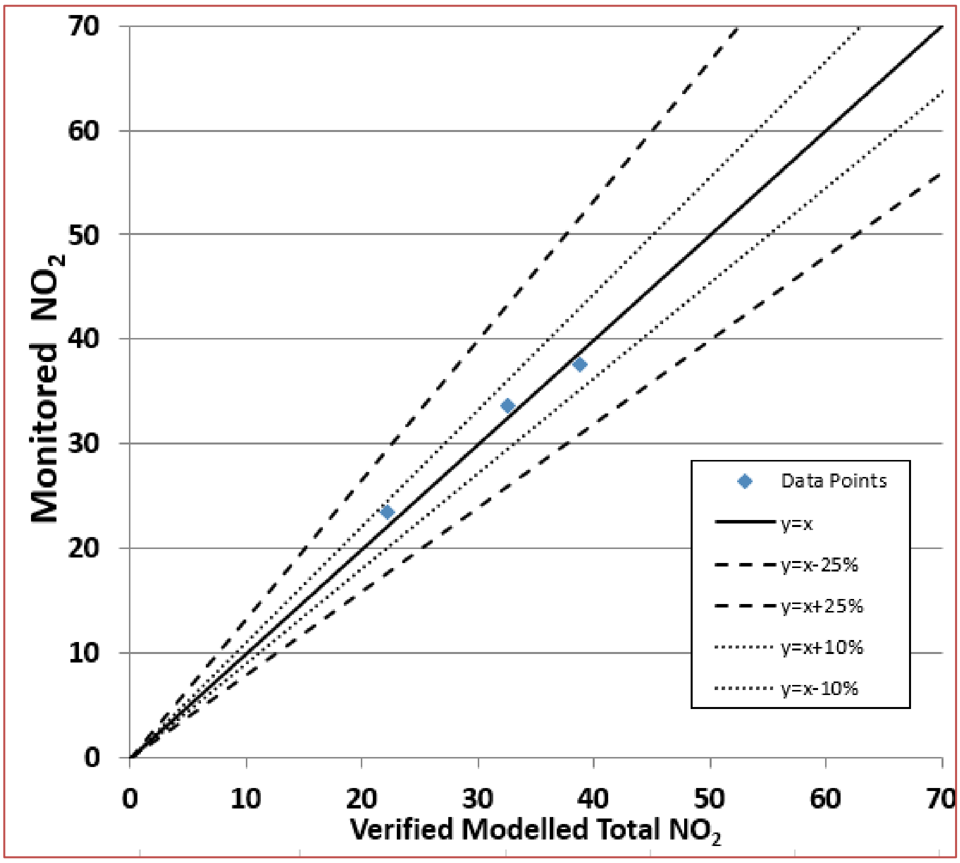


Table B.5 – Final St Lawrence High Street Area Verification

Site ID	Ratio of monitored road contribution NO_x / modelled road contribution NO_x	Adjustment factor for modelled road contribution NO_x	Adjusted modelled road contribution NO_x (µg/m³)	Adjusted modelled total NO_x (including background NO_x) (µg/m³)	Modelled total NO_2 (based upon empirical NO_x / NO_2 relationship) (µg/m³)	Monitored total NO_2 (µg/m³)	% Difference (adjusted modelled NO_2 vs. monitored NO_2)
TH54/64/65	6.94	6.574	42.22	57.27	32.62	33.70	-1.08
TH70/71/72	6.26		55.95	71.00	38.75	37.60	1.15
TH86	7.30		20.73	35.79	22.25	23.40	-1.15

Figure B.6 – Final St Lawrence High Street Area Adjusted Verification Monitored NO_2 Concentrations vs. Verified Modelled NO_2



Appendix C – Background Concentrations

Table C.1 – Background Concentrations in Thanet

Grid Square (X, Y)	NO_2	NO_x	PM_{10}
637500, 165500	11.3	15.1	15.6
636500, 165500	10.9	14.4	15.3
638500, 165500	11.8	15.8	15.7
629500, 168500	8.9	11.6	15.4
630500, 168500	9.5	12.4	15.0
630500, 169500	9.6	12.6	14.5
Background locations have been taken from the Defra Background Mapping resource for Thanet District Council.			